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RECORDS OF MEETINGS, 1906–1907.

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RECORDS OF MEETINGS.

Nine hundred and sixty-seventh Meeting.

OCTOBER 10, 1906. — STATED MEETING.

The Academy met at its House.

The PRESIDENT in the chair.

There were present twenty-three Fellows.

The Corresponding Secretary read the following communications: From the University of Pennsylvania, inviting the Academy to send a representative to the dedication of the new building of its engineering department; from the Curator of the Reale Universita Napoli, offering for sale collections of specimens of the materials ejected in the recent eruption of Vesuvius; from the American Philosophical Society, presenting the medal struck by order of the Congress of the United States in honor of the two hundredth anniversary of the birth of Benjamin Franklin; one from the same Society acknowledging the address presented by the Academy on the occasion of the above celebration; from the Director of the Observatorio Astronomico de la Plata, announcing the annexation of the Observatorio to the Universidad Nacional; from the family of Ludwig Boltzmann, announcing his death, and also the same announcement from the University of Vienna; from the Museo Nacional, Mexico, announcing the death of Manuel Urbina, chief of the department of natural history.

The following deaths were announced by the Chair: —

Edward J. Young, Resident Fellow in Class III, Section 2; Bennett H. Nash, Resident Fellow in Class III, Section 2; Ludwig Boltzmann, Foreign Honorary Member in Class I,

Section 2; J. W. A. Kirchhoff, Foreign Honorary Member in Class III, Section 2.

Professor G. F. Swain was appointed by the President to represent the Academy at the dedication of the building of the engineering department of the University of Pennsylvania.

At the request of the President, Professor Ware gave some information in regard to the ventilation of the Meeting-room, with its estimated cost. After some discussion, on motion of the Recording Secretary, the whole subject was referred to the President, with full power.

The following communications were given: —

"An Ascent of Orizaba, Mexico," by Professor John E. Wolff; "On Some Elements of Conservatism in Ancient Greece," by Professor Herbert Weir Smyth.

The following paper was presented by title: —

Contributions from the Gray Herbarium of Harvard University. New Series. — No. XXXIII. "Revision of the Genus Spilanthes." By Albert Hanford Moore. Presented by B. L. Robinson.

Nine hundred and sixty-eighth Meeting.

NOVEMBER 14, 1906.

The Academy met at its House.

The PRESIDENT in the chair.

There were present twenty-two Fellows.

The Corresponding Secretary read the following letters: From the Délégation pour l'Adoption d'une Langue Auxiliaire Internationale, offering to members of the Academy the resources of the Delegation for the propaganda in the United States; from the Board of Managers for Massachusetts, of the Jamestown Exposition, asking for the loan of objects of historical interest for display at the Exposition.

The following communications were given: —

"The Ancient Coniferous Flora of New England," by Professor E. C. Jeffrey; "The Ancient Water-levels of the Champlain and Hudson Valleys," by Professor J. B. Woodworth.

The following papers were read by title: —

"Description of Bermuda Hydroids." By Edgar Davidson Congdon. Presented by E. L. Mark.

"The Transmission of Röntgen Rays through Metallic Sheets." By John Mead Adams. Presented by John Trowbridge.

Nine hundred and sixty-ninth Meeting.

DECEMBER 12, 1906.

The Academy met at its House.

The PRESIDENT in the chair.

There were present twenty-two Fellows.

The Corresponding Secretary read a letter from Mr. Henry H. Edes, presenting to the Academy a photographic copy of the certificate of Membership in the Academy, which was given in 1781, to Benjamin Franklin.

On motion of the Corresponding Secretary, it was

Voted, That the thanks of the Academy be tendered to Mr. Edes for his gift.

The Chair announced the following deaths: —

Samuel Cabot, Resident Fellow in Class I, Section 3; F. Brunetière, Foreign Honorary Member in Class III, Section 4.

A proposition from the Council for the establishment of an emeritus list of Resident Fellows was read; this proposition, requiring a change in the statutes, was referred to a committee consisting of Charles P. Bowditch, A. Lawrence Rotch, William Watson.

The following recommendation from the Council was read by the Corresponding Secretary: —

That an appropriation of five hundred dollars ($500) be made from the income of the Publication Fund, for the use of the Publishing Committee for the remainder of the year.

The following communication was given: —

"The Surface Temperature of Mars (from a New Determination of the Solar Heat received by it)." By Professor Percival Lowell.

The following papers were read by title: —

"An Electric Wax-Cutter for Use in Reconstruction." By E. L. Mark.

"On the Magnetic Behavior of the Finely Divided Core of an Electro-magnet or of a Transformer while a Steady Current is being established in the Exciting Coil." By B. O. Peirce.

"The Sensation of Loudness." By W. C. Sabine.

Nine hundred and seventieth Meeting.

JANUARY 9, 1907. — STATED MEETING.

The Academy met at its House.

The PRESIDENT in the chair.

There were present twenty-five Fellows.

On the recommendation of the Council, at the request of the Chairman of the Publication Committee, and with the approval of the Treasurer, it was

Voted, To appropriate the sum of five hundred dollars ($500) from the income of the Publication Fund for the use of the Publication Committee for the remainder of the year.

On motion of the Chairman of the Rumford Committee, it was

Voted, To appropriate the sum of three hundred and seventy-five dollars ($375) from the income of the Rumford Fund for the use of the Rumford Committee in the furtherance of research.

The report of the Committee on Amendments to the Statutes was read and accepted, and, in accordance therewith, it was

Voted, To amend the Statutes as follows: —

Chapter I, Section 2, line 1. After the word "Fellows" add "residing in the Commonwealth of Massachusetts."

This amendment was passed by a vote of three-fourths of the members present, there being eighteen (18) affirmative votes.

The following communications were given: —

"The Meteorology of the North and South Polar Zones." By R. DeC. Ward.

"The Corpuscular Theory as applied to Electric Conduction in Gases." By Theodore Lyman.

The following papers were read by title: —

"On Linear Differential Equations of the Parabolic Type." By M. M. Smith. Presented by Maxime Bôcher.

"The Spermatogenesis of the Myriapods. V. On the Spermatocytes of Lithobius." By Maulsby W. Blackman. Presented by E. L. Mark.

"Concerning the Adiabatic Determination of the Heats of Combustion of Organic Compounds, especially Sugar and Benzol." By T. W. Richards, L. J. Henderson, and H. L. Frevert.

"Concerning Position Isomerism and Heats of Combustion." By L. J. Henderson. Presented by T. W. Richards.

"The Determination of Small Amounts of Antimony by the Berzelius-Marsh Process." By C. R. Sanger and James A. Gibson.

"The Determination of Arsenic in the Urine." By C. R. Sanger and Otis F. Black.

"The Determination of Arsenic by the Guthzeit Method." By C. R. Sanger and Otis F. Black.

Nine hundred and seventy-first Meeting.

FEBRUARY 13, 1907.

The Academy met at the Walker Building of the Massachusetts Institute of Technology.

The PRESIDENT in the chair.

There were present twenty-five Fellows and eighteen guests.

The following letters were read: From the Société Imperiale russe de Géographie, on the occasion of the eightieth anniversary of M. Pierre de Sémènov; from E. van Everdingen, announcing his appointment as Director of the Netherlands Meteorological Institute; from the Académie de Macon, enclosing the medal of its centennial; from the Seventh International Zoölogical Congress, inviting the Academy to be represented by delegates at its meeting in Boston, August 19 to 23, 1907.

The President announced that the Rumford Medal had been awarded to Professor Ernest Fox Nichols for his researches on radiation, particularly on the pressure due to radiation, the heat of the stars, and the infra-red spectrum. He then called

upon Professor Charles R. Cross, Chairman of the Rumford Committee, to state the grounds on which the award was made.

Professor Cross gave a brief account of Professor Nichols' researches, after which the President, in the name of the Academy, presented the medal to Professor Nichols, who made an appropriate reply expressing his appreciation of the high honor which had been conferred upon him.

Professor Nichols then showed experiments demonstrating the pressure of rays of light.

Remarks were made on this subject by Professor Webster, who concluded with the motion that a vote of thanks be given to Professor Nichols for his admirable experimental demonstrations.

The following papers were presented by title: —

"The Kathode-luminescence of Fluorite." By Harry W. Morse. Presented by John Trowbridge.

"On the Self and Mutual Inductance of Cylindrical Solenoids." By A. G. Webster.

Contributions from the Gray Herbarium of Harvard University. New Series. — No. XXXIV. I. "New Species of Senecis and Schoenocaulon from Mexico." By J. M. Greenman. II. "New or otherwise noteworthy Spermatophytes, chiefly from Mexico." By B. L. Robinson. III. "New Plants from Guatamala collected by C. C. Deam." By B. L. Robinson and H. H. Bartlett. IV. "Diagnoses of New Spermatophytes from Mexico." By M. L. Fernald. Presented by B. L. Robinson.

Nine hundred and seventy-second Meeting.

MARCH 13, 1907. — STATED MEETING.

The Academy met at its House.

The PRESIDENT in the chair.

There were present twenty-one Fellows.

Letters were read from Henry S. Pritchett, Henry G. Denny, David W. Cheever, and Jeremiah Smith, resigning Fellowship; from the Michigan Agricultural College, inviting the Academy to be represented by delegates at its fiftieth anniversary, May

28–31, 1907; from the Smithsonian Institution, informing the Academy of the election of Charles Doolittle Walcott as its Secretary; from G. Capellini, inviting the Academy to participate in the celebration of the three hundredth anniversary of the death of Ulisse Aldrovandi, June 12, 1907, at Bologna; also, printed communications regarding the adoption of an international language.

On motion of the Recording Secretary, it was unanimously

Voted, To invite Dr. William Everett, Professor Amos E. Dolbear, and Mr. Henry G. Denny to attend the meetings of the Academy, and to make use of the library.

The Chair announced the following death: —

Dimitri Mendeleeff, Foreign Honorary Member in Class I, Section 3.

The following gentlemen were elected Members of the Academy: —

William Zebina Ripley, of Newton, as Resident Fellow in Class III, Section 3 (Political Economy and History).

Edward Henry Hall, of Cambridge, as Resident Fellow in Class III, Section 4 (Literature and the Fine Arts).

William Coolidge Lane, of Cambridge, as Resident Fellow in Class III, Section 4 (Literature and the Fine Arts).

Magnus Gustav Retzius, of Stockholm, as Foreign Honorary Member in Class II, Section 3 (Zoölogy and Physiology), in place of the late Albert von Kölliker.

Hermann Diels, of Berlin, as Foreign Honorary Member in Class III, Section 2 (Philology and Archaeology), in place of the late J. W. A. Kirchhoff.

The President appointed the following Councillors to act as Nominating Committee: —

WILLIAM T. SEDGWICK, of Class II.
ELIHU THOMSON, of Class I.
ANDREW MCF. DAVIS, of Class III.

The following Communications were given: —

Professor S. P. Sharples, "Cobalt and Silver Deposits of Cobalt, Canada."

Professor D. W. Johnson, "The Volcanic Necks of the Mt. Taylor Region, New Mexico" (by invitation).

The following papers were read by title: —

"The Process of building up the Voltage and Current in a Long Alternating-Current Circuit." By A. E. Kennelly.

"High Electromotive Force with its Application to Spectrum Analysis." By John Trowbridge.

Nine hundred and seventy-third Meeting.

APRIL 10, 1907.

The PRESIDENT in the chair.

There were present sixteen Fellows.

The Corresponding Secretary read the following letters: From Edward H. Hall, William C. Lane, and William Z. Ripley, acknowledging election as Resident Fellows; from Hermann Diels, acknowledging election as Foreign Honorary Member; from Amos E. Dolbear and Henry G. Denny, thanking the Academy for its invitation to attend the meetings and to use the library; from the Geological Society of London inviting the Academy to appoint a delegate to attend its centennial celebration, September 26, 27, and 28, 1907; from the Comité Géologique de la Russie, announcing the death of M. Nicholas Sokolow; from Columbia University in the City of New York, announcing the Loubat prizes to be awarded in 1908.

The Chair announced the following death: —

Marcellin Berthelot, Foreign Honorary Member in Class I, Section 3.

The following delegates were appointed by the chair: —

Professor Ephraim Emerton (Professor Angelo Celli of Rome, alternate), to attend the celebration at Bologna of the three hundredth anniversary of the death of Ulisse Aldrovandi, June 12, 1907; President James Burrill Angell, to attend the celebration at Lansing, Michigan, of the fiftieth anniversary of the Michigan Agricultural College, May 28 to 31, 1907; Professor Edward Laurens Mark, to attend the Seventh International Zoölogical Congress at Boston, August 19 to 23, 1907.

The following communications were given: —

"On the Physiological Basis of Illumination." By Dr. Louis Bell.

"Meteorological Observations in 1906 above the Tropical and Equatorial Atlantic." By Professor A. Lawrence Rotch.

The following paper was presented by title: —

"The Demagnetizing Factors for Cylindrical Magnets of Different Dimensions." By C. L. B. Shuddemagen. Presented by B. O. Peirce.

Nine hundred and seventy-fourth Meeting.

MAY 8, 1907. — ANNUAL MEETING.

The PRESIDENT in the chair.

There were present twenty-two Fellows.

Letters were read from E. F. Sawyer and J. S. Kingsley, resigning Fellowship; from Gustav Retzius, acknowledging election as Foreign Honorary Member; from the New York Academy of Sciences, inviting the Academy to be represented at the celebration of the two hundredth anniversary of the birth of Carl von Linné, and also to contribute an official document appreciative of the work of Linné.

On motion of the Recording Secretary it was

Voted, That the appointment of Delegates to the celebrations of the Geological Society of London and the New York Academy of Sciences be intrusted to the President.

The Chair announced the death of Sir Michael Foster, Foreign Honorary Member in Class II, Section 3.

The annual report of the Council was read.[1]

The annual report of the Treasurer was read, of which the following is an abstract: —

GENERAL FUND.

Receipts.

Investments	$1,683.01	
Assessments	1,880.00	
Admission fees	40.00	
Rent of offices	1,200.00	$4,803.01
Expenditures.		
General expenses	$3,603.47	
Library	1,199.54	$4,803.01

[1] See p. 761.

Rumford Fund.

Receipts.

Balance, April 30, 1906	$ 451.23	
Investments, etc.	2,614.75	$3,065.98

Expenditures.

Research	$1,490.00	
Publication	788.54	
Library	149.35	
Charged to reduce book value of stocks	451.23	$2,879.12
Balance, April 30, 1907		186.86
		$3,605.98

C. M. Warren Fund.

Receipts.

Balance, April 30, 1906	$ 940.06	
Investments	347.74	$1,287.80

Expenditures.

Research	$ 450.00	
Vault rent	4.00	
Premium on bonds charged off	50.00	
Accrued interest on bonds bought	20.83	$ 524.83
Balance, April 30, 1907		762.97
		$1,287.80

Publication Fund.

Receipts.

Balance, April 30, 1906	$ 961.68	
Investments	2,854.50	
Sale of publications	130.35	
Authors	179.23	$4,125.76

Expenditures.

Publication	$3,275.42	
Charged to reduce book value of investments	625.00	
Vault rent	12.50	$3,912.92
Balance, April 30, 1907		212.84
		$4,125.76

The following reports were also presented : —

REPORT OF THE LIBRARIAN.

During the past year the Assistant Librarian and Miss Wyman, as cataloguer, have been employed in verifying and continuing the typewritten catalogue, begun by Dr. Holden, and also in classifying the books according to the classification adapted by him to this library. The subjects, mathematics, astronomy, physics, light, heat, electricity, chemistry, the useful arts (including engineering), natural history, geology, mineralogy, and about one-half of meteorology, are entirely catalogued and classified. This includes all serial publications relating to the subjects mentioned. There remains to be done, paleontology, botany, zoölogy, agriculture, medicine, the moral and political sciences, and the books and serial publications on general science. As Miss Wyman can only give two or three hours a day during the coming year, the catalogue will probably not be completed for some months, but the thoroughness with which the work has been done compensates for the length of time taken.

It is very much to be desired that each member of the Academy should present to the library a copy of any scientific work of which he is the author. The books on the various subjects were, as a rule, well chosen in the past, and form what might be called the nucleus to a valuable library, but some years ago, through lack of funds, it was decided to purchase no more books from the General Fund; therefore donations are much needed.

The accessions during the year have been as follows : —

	Vols.	Parts of Vols.	Pams.	Maps.	Total.
By gift and exchange . . .	144	2396	85	8	2633
By purchase — General Fund	3	690			693
By purchase — Rumford Fund	1	336			337
Total	148	3422	85	8	3663

61 books have been borrowed from the library by 18 persons, including 10 Fellows. The library has been consulted many times when no books were taken.

All the books borrowed during the year have been returned for the annual examination. Of the books reported as still out a year ago, all have been returned except 5 (taken out by one person).

The expenses charged to the library are as follows : Miscellaneous, $400 (which includes $206.25 for cataloguing) ; Binding, $417.65, General, and $44.70, Rumford, Funds ; Subscriptions, $381.89, General,

and $104.65, Rumford, Funds; making a total of $799.54 for the General, and $149.35 for the Rumford, Funds as the cost of binding and subscriptions.

A. LAWRENCE ROTCH, *Librarian.*

May 8, 1907.

REPORT OF THE RUMFORD COMMITTEE.

During the past year the Committee has made the following grants in aid of research, from the amount placed at its disposal by the Academy for that purpose.

Oct. 10, 1906. Professor Arthur A. Noyes, of the Massachusetts Institute of Technology, for the construction of a calorimeter for the determination of heats of reaction at high temperatures . . . $300

Professor R. W. Wood, of the Johns Hopkins University, for the purchase of quartz lamps (additional appropriation) . 200

Nov. 14, 1906. Professor Norton A. Kent, of Boston University, for the continuation of work on spectral lines (additional appropriation) 75

Professor L. R. Ingersoll, of the University of Wisconsin, for an investigation of the Kerr Effect in the infra red rays . . . 200

Professor Frederick E. Kester, of the Ohio State University, for a research on the thermal properties of gases flowing through porous plugs (additional appropriation) 315

March 13, 1907. Dr. Harry W. Morse, of Harvard University, for his research on fluorescence (additional appropriation) . 400

Since the last Annual Meeting papers as follows have been published at the expense of the Rumford Fund. Two additional papers are now in press.

"Dispersion in Electric Double Refraction." H. L. Blackwell, May, 1906.

"The Thermal Conductivity of Lead." F. L. Bishop, May, 1906.

"Fluorescence and Magnetic Rotation Spectra of Sodium Vapor, and their Analysis." R. W. Wood, November, 1906.

"Expansion and Compressibility of Ether and of Alcohol in the Neighborhood of their Boiling Points." A. W. Smith, January, 1907.

"Concerning the Adiabatic Determination of the Heats of Combustion of Organic Substances, especially Sugar and Benzol." T. W. Richards and Messrs. Henderson and Frevert. March, 1907.

"On the Thomson Effect and the Temperature Coefficient of Thermal Conductivity in Soft Iron between 115° and 204° C." E. H. Hall and Messrs. Campbell, Serviss, and Churchill. March, 1907.

"Concerning Position Isomerism and Heats of Combustion." L. J. Henderson. March, 1907.

"Temperature of Mars. A Determination of the Solar Heat Received." P. Lowell. March, 1907.

"The Transmission of Röntgen Rays through Metallic Sheets." J. M. Adams. April, 1907.

Reports of progress in their respective researches have been received from Messrs. A. L. Clark, J. A. Dunne, E. B. Frost, G. E. Hale, W. I. Humphreys, L. R. Ingersoll, N. A. Kent, F. E. Kester, A. B. Lamb, C. E. Mendenhall, R. S. Minor, H. W. Morse, A. A. Noyes, J. A. Parkhurst, T. W. Richards, F. A. Saunders, C. B. Thwing, J. Trowbridge, R. W. Wood.

At its meeting of January 9, 1907, the Committee voted for the first time, and at its meeting of February 13, 1907, for the second time, to recommend to the Academy that the Rumford Premium be awarded to Edward Goodrich Acheson for the Application of Heat in the Electric Furnace to the Industrial Production of Carborundum, Graphite, and other New and Useful Substances.

CHARLES R. CROSS, *Chairman.*

May 8, 1907.

Professor Cross continued as follows: —

Mr. President and Gentlemen of the Academy, — In presenting the claims of Mr. Acheson for the Rumford Premium, in view of the character of the work upon which the recommendation of the Committee is based, instead of making an independent statement of my own, I will read a report upon that work which was presented to the Committee by one of its members, than whom there is none more competent to pronounce an opinion upon any subject concerning applied electricity. I hardly need to say that I refer to Professor Elihu Thomson.

The report is as follows:

"The early experimenters with the carbon arc from voltaic batteries found that the temperature developed transcended that of all other sources of artificial heat, and numerous substances subjected thereto were found to undergo profound changes. It may suffice to quote from Silliman's Physics, a text-book in common use some forty years ago, page 589, paragraph 886 of the edition of 1870, 'Heat of the Voltaic Arch Deflagration': 'Where the positive electrode is fashioned into a small crucible of carbon, gold, silver, platinum, mercury, and other substances are speedily fused, deflagrated, or volatilized, with various colored lights. The fusion of platinum (like wax in a candle) before the voltaic arch is significant of its intense heat, and still more, the

volatilization and fusion of carbon, a result first announced by Professor Silliman in 1822 and since confirmed by Despretz, who by the union of the heat of six hundred carbon couples arranged in numerous parallel series, and conjoined with the jet of an oxyhydrogen blowpipe, and the heat of the midday sun, focalized by a powerful burning glass, succeeded in volatilizing the diamond, fusing magnesia and silica, and softening anthracite. The diamond is also softened, and converted into a black spongy mass resembling coke, or, more nearly, the black diamond found in the Brazilian mines.'

"The fusion of carbon referred to is evidently a mistake, but the softening of anthracite probably resulted in its conversion into graphite.

"Upon the advent of the dynamo during the decade of 1870 to 1880, the ability to obtain and maintain electric arcs with comparative ease made it possible to apply electric heat to larger crucibles and to note again the facile conversion of impure varieties of carbon into graphite. The first attempts to apply electric heating on a fairly large scale in obtaining new products was probably made by Cowles in 1886, using a mixture of carbon, aluminum oxide, and copper, whereby there was formed aluminum bronze. The operation involved the direct reduction of alumina by carbon, but if this were attempted without the presence of the alloying metal copper, a carbide of aluminum was formed and no metal. The operation was rather irregular and uncertain, but stands as a worthy effort to apply electricity to smelting. The heat generated in the mass of materials undergoing the operation was due to resistance of innumerable contacts throughout the granular mass, to the resistance of the materials themselves, and possibly to incipient arcing between particles.

"Mr. Edward G. Acheson, who had assisted in the Edison Menlo Park laboratory in 1880 and 1881, and who up to 1889 and later was connected with electric work as engineer, superintendent, or electrician, began to work with an electric furnace in 1891. In attempting to 'impregnate clay with carbon under the influence of the high heat obtainable with the electric current' he noted the formation of a few bright specks. After having separated out one of these specks, he drew it across a pane of glass, which it scratched and cut. This led to further experiments, and a small vial of the new product was taken to New York under the name 'carborundum,' as Mr. Acheson was laboring under the mistake that it contained carbon and corundum. It was tried in cutting diamond, with the result that the diamond cutter bought the material at thirty cents per carat. This was the first sale of the new abrasive. On finding that it was the silica in the clay

which had reacted with the carbon, sand was substituted for the clay before used. Mr. Acheson then planned a furnace substantially the same as that now used in the manufacture at Niagara, — a central core of carbon pieces resting on the floor of the furnace and connecting heavy carbon terminals or electrodes, around which core was packed the mixed materials to be heated, which in the case of the production of carborundum are sand, coke-powder, and a little common salt.

"Meeting with troubles and trials, the usual lot of pioneers, and having his efforts at last crowned with success, the carborundum manufacture has become a large industry. In 1894 a steam generating plant of less than 150 horse power was used, and the cost of production greatly restricted the applications of the product. Only one half the product found a market. It was then that, in spite of the opposition of the directors of his company, Mr. Acheson insisted on removing to Niagara, so as to manufacture more cheaply with large amounts of relatively cheap electric energy. The wisdom of this insistence soon became manifest. One thousand horse power was consumed in a single carborundum furnace. In 1904 the Carborundum Company had a plant of five thousand electrical horse power, and produced over seven millions of pounds of carborundum or silicon carbide.

"Later on Mr. Acheson found that when carborundum was very highly heated in the furnace in which it was formed the silicon was evaporated from the crystals and graphite left as a pseudomorph. This observation led the way to experiments and methods which formed the basis of another large industry carried on by the National Acheson Graphite Company at Niagara. Its product is plumbago, a graphite made by heating to a high temperature impure carbon, such as anthracite coal. The silica and clay in the ash apparently provide material for the chemical changes which result in the conversion, and the impurities are themselves finally vaporized out of the mass to a large extent. That impure carbon was convertible into graphite at high temperatures was known. Rods of carbon were so converted by the writer in 1882. The carbon electrodes of arc lights, especially large arcs, were noted to have been after burning so converted for a small distance from the ends at the arc, and this was particularly noticeable at the positive craters of large arcs, which, of course, during burning attained a temperature limited only by the sublimation of the carbon itself. It is, however, due to Mr. Acheson that the production of artificial graphite has become a great commercial success. Rods, bars, plates of carbon converted into Acheson graphite, are now extensively used in electro-chemical and electro-metallurgical industries, almost to the complete exclusion of the ordinary moulded carbon formerly used.

The graphite is used as a filler for dry batteries, and is being applied in place of natural graphite in stove polish, lubrication, foundry facings, and as a pigment for paints. It is easily reducible to a very fine powder. The graphite is nearly pure, containing about one-half per cent of impurities when used for electro-chemical electrodes, and about three per cent when used for paint. A good quality of natural graphite may be eighty-five per cent pure, and much of it on the market is as low as forty-five per cent. The solid bars of artificial graphite have a relatively high electric conductivity, estimated at about four times that of ordinary amorphous carbon rods. They disintegrate in electro-chemical work at a much lower rate than the former electrodes, for which they have become the substitute. In some cases the life of the electrode is increased twelve times. During 1905 the Acheson Graphite Company produced about two and a half millions of pounds of graphite electrodes and nearly two millions of pounds of bulk graphite, made principally from anthracite coal.

"Two other electric furnace products have been added more recently as the outcome of Mr. Acheson's experiments. In attempting to reduce the element silicon by electrically heating an intimate mixture of fine graphite and pure silica, the amount of carbon being only that sufficient to remove the oxygen, Mr. Acheson noted not only the reduction of the silicon in part, but the production of a quantity of a greenish gray fluffy substance which, from the circumstances of its production, he recognized as highly refractory. The manufacture of silicon itself was turned over to the carborundum company in 1901, since which time this manufacture has been extended and perfected so that the element silicon, once a rare curiosity of the chemical laboratory, seen only in small crystals and in samples of small amount, has become a commercial product of low price.

"The greenish gray fluffy mass referred to when analyzed gave the formula Si_2C_2O, and was named siloxicon. It is amorphous and said to be inert to acid and basic slag, insoluble in fused iron, and packs or binds itself when pressed and then heated to about 2500 degrees F. Briquettes can thus be made, resisting the highest furnace temperatures. Attention is now being given to this substance as a material for crucibles, muffles, fire bricks, fire-resisting linings, etc.

"Mr. Acheson has contributed several papers to technical journals and societies, an incomplete list being as follows: —

"'The Influence of the Condenser on Disruptive Discharges.' Electrical World, July 7, 1888.

"'Disruptive Discharges and their Relations to Underground Cables.' Before the National Electric Light Association, August 29, 1888.

"'Lightning Arresters and the Photographic Study of Self-Induction.' Before the American Institute of Electrical Engineers, January 8, 1889.

"'Carborundum: its History, Manufacture, and Uses.' Before the Franklin Institute, June 21, 1893.

"'Graphite: its Foundation and Manufacture.' Before the Franklin Institute, March 15, 1899.

"'Egyptianized Clay.' Before the American Ceramic Society, in 1903.

"'Discovery and Invention.' Before the Society of Mining Engineers, Massachusetts Institute of Technology, March 9, 1906.

"He has received some forty United States patents, chiefly relating to carborundum, graphite, and other products of the electric furnace.

"In conclusion, it may be said that the labors of Mr. Acheson have, through the agency of electric heat, in furnaces especially designed for its utilization, and by methods devised by him, provided a new abrasive only inferior to the diamond in hardness and toughness, much harder than emery or carborundum, of which it largely takes the place, whether used in the form of graded sizes of grains or in slabs, or in the construction of grinding wheels. His work has also developed a source of nearly pure graphite aside from the usual mining of this substance, and which promises to become the principal supply of such material. It has supplied compact graphite in any form desired, and of high endurance and purity, for electrodes in electro-chemical industry. There has resulted from the work of Mr. Acheson a commercial production of the element silicon, before known in small amounts as a curiosity of the chemical cabinet. This element promises to fill a need for electric-resistance materials, and for chemical ware unattackable by strong acids even when hot, hydrofluoric among the number. It can be cast in any form in ordinary moulds, and stands rapid changes of temperature when in the form of crucibles or dishes not too thick. It oxidizes but slightly in the air even at high temperatures. Lastly, the work of Mr. Acheson provides a new material, — siloxicon, — the properties of which promise to render it a very valuable addition to our resources in high temperature furnace processes. He is to be commended for his persistency, ingenuity, and sagacity in applying the heating effect of electrical energy to technical problems of the highest importance."

I can add to this only that the committee is heartily unanimous in the opinion that the labors of Mr. Acheson fully entitle him to the honor of the award.

It was then

Voted, That the Rumford Premium be awarded to Mr. Edward Goodrich Acheson for the "Application of Heat in the Electric Furnace to the Industrial Production of Carborundum, Graphite, and other new and useful Substances."

REPORT OF THE C. M. WARREN COMMITTEE.

The C. M. Warren Committee beg leave to report that during the last year they have made the following grants from the C. M. Warren Fund: —

Professor Walter L. Jennings, of the Worcester Polytechnic Institute for a research on the acetyl derivatives of rosaniline and pararosaniline $100

Dr. J. Bishop Tingle, of Johns Hopkins University, for research on the hydrazine derivatives of the camphor oxalic acids 50

Mr. Richard C. Tolman, Research Laboratory of Physical Chemistry, Massachusetts Institute of Technology, for the construction of apparatus to be used in the measurement of the difference in electrical potential between the inner and outer ends of rotating tubes containing salt solutions, this apparatus to be the property of the American Academy of Arts and Sciences, and to be returned to the C. M. Warren Committee on the completion of Mr. Tolman's investigations 300

Acknowledgments of these grants and satisfactory reports of progress have been received.

LEONARD P. KINNICUTT, *Chairman.*

May 8, 1907.

REPORT OF THE PUBLICATION COMMITTEE.

During the last year there were published of the Proceedings three numbers of Volume XLI (33–35), and twenty-six numbers of Volume XLII; also one biographical notice; in all, 854 + v pages and eleven plates. Seven numbers of Volume XLII (13, 17, 21, 22, 24, 25, and 26) were paid for from the income of the Rumford Fund.

Of the Memoirs, one number (Volume XIII, No. 4, pp. 149–179, plates IX–XXIV) has been published.

Under the ruling that balances of appropriations unexpended at the end of the year revert to the general funds of the Academy, and that the proceeds from sales of publications are not available for the purposes of publication except by special vote of the Academy to that effect, the funds available for publication during the year just closed

have been limited to the appropriation of $2600 voted at the annual meeting, May 9, 1906, and an additional appropriation of $500 voted January 9, 1907; in all, $3100. However, several authors bore a portion of the expense of their papers. Sometimes it was convenient to have the author pay a lump sum to the Academy rather than send him a separate bill. The money so received aggregated $179.23, and was turned over to the Treasurer for credit to the General Publication Fund. Against this total sum of $3279.23 bills aggregating $3279.22 have been approved, thus leaving an unexpended balance of one cent.

There are now three papers in press for the Proceedings, the estimated unpaid expense of which is $282, and unpaid bills amounting to $27.25.

Bills for publications on account of the Rumford Fund amounting to $887.01 have been forwarded to the chairman of the Rumford Committee for approval.

One number of the Memoirs, estimated to cost for the text $145, and one number of the Proceedings, estimated to cost $86, are in press as Rumford papers.

EDWARD L. MARK, *Chairman.*

May 8, 1907.

FINANCIAL REPORT OF THE COUNCIL.

The income of the Academy for the year 1907–8, as estimated by the Treasurer, is as follows:

GENERAL FUND	Investments	$1608	
	Assessments	1800	
	Rent of offices	1200	$4608
PUBLICATION FUND	Appleton Fund investments	$ 556	
	Centennial Fund investments	2178	$2734
RUMFORD FUND	Investments		$2547
WARREN FUND	Investments		$584

The following appropriations are recommended:

GENERAL FUND.

House expenses	$1200	
Library expenses	1600	
Books, periodicals, and binding	900	
Expenses of meetings	250	
Treasurer's office	150	$4100

RUMFORD FUND.

Research	$1000	
Periodicals and binding	150	
Books and binding	50	
Publication	700	
To be used at discretion of Committee	264	
Unexpended balance of 1906–7 appropriation	186	$2350

C. M. WARREN FUND.

Research	$500

PUBLICATION FUND.

Publication	$2400

In accordance with the recommendations in the foregoing report it was

Voted, To appropriate for the purposes named the following sums: —

From the income of the General Fund	$4100
From the income of the Rumford Fund	2350
From the income of the C. M. Warren Fund	500
From the income of the Publication Fund	2400

On the motion of the Treasurer, it was

Voted, That the annual assessment for the ensuing year be ten dollars ($10).

The annual election resulted in the choice of the following officers and committees: —

WILLIAM W. GOODWIN, *President.*
JOHN TROWBRIDGE, *Vice-President for Class I.*
HENRY P. WALCOTT, *Vice-President for Class II.*
JOHN C. GRAY, *Vice-President for Class III.*
EDWIN H. HALL, *Corresponding Secretary.*
WILLIAM WATSON, *Recording Secretary.*
CHARLES P. BOWDITCH, *Treasurer.*
A. LAWRENCE ROTCH, *Librarian.*

Councillors for Three Years.

HENRY P. TALBOT, of Class I.
JOHN E. WOLFF, of Class II.
GEORGE L. KITTREDGE, of Class III.

Finance Committee.

WILLIAM W. GOODWIN,
ELIOT C. CLARKE,
FRANCIS BARTLETT.

Rumford Committee.

CHARLES R. CROSS, ARTHUR G. WEBSTER,
EDWARD C. PICKERING, ELIHU THOMSON,
THEODORE W. RICHARDS, ERASMUS D. LEAVITT,
LOUIS BELL.

C. M. Warren Committee.

LEONARD P. KINNICUTT, CHARLES R. SANGER,
ROBERT H. RICHARDS, ARTHUR A. NOYES,
THEODORE W. RICHARDS, HENRY P. TALBOT,
GEORGE D. MOORE.

The following standing committees were appointed by the Chair: —

Publication Committee.

WALLACE C. SABINE, of Class I, EDWARD L. MARK, of Class II,
CRAWFORD H. TOY, of Class III.

Library Committee.

HARRY M. GOODWIN, of Class I, SAMUEL HENSHAW, of Class II,
HENRY W. HAYNES, of Class III.

Auditing Committee.

A. LAWRENCE LOWELL, FREDERICK J. STIMSON.

House Committee.

WILLIAM R. WARE, A. LAWRENCE ROTCH,
MORRIS H. MORGAN.

The following gentlemen were elected members of the Academy: —

Charles Ladd Norton, of Boston, to be a Resident Fellow in Class I, Section 2 (Physics).

George Washington Pierce, of Cambridge, to be a Resident Fellow in Class I, Section 2 (Physics).

Gregory Paul Baxter, of Cambridge, to be a Resident Fellow in Class I, Section 3 (Chemistry).

The following communications were given:

"Variable Stars in the Globular Clusters." By Professor S. I. Bailey.

"The Eastern Escarpment of the Mexican Plateau." By Professor W. M. Davis.

The following paper was presented by title:

Contribution from the Research Laboratory of Physical Chemistry. — No. 15. "On the Density, Conductivity, and Viscosity of Fused Electrolytes." By H. M. Goodwin and R. D. Mailey.

AMERICAN ACADEMY OF ARTS AND SCIENCES.

REPORT OF THE COUNCIL. — PRESENTED MAY 8, 1907.

BIOGRAPHICAL NOTICE.

EDWARD ATKINSON . . . . . THOMAS WENTWORTH HIGGINSON.

REPORT OF THE COUNCIL.

The Academy has lost nine members by death since the report of the Council at the Annual meeting, May 9, 1906: three Resident Fellows, Edward J. Young, Bennett H. Nash, Samuel Cabot; six Foreign Honorary Members, J. W. A. Kirchhoff, Ludwig Boltzmann, F. Brunetière, D. Mendeleeff, M. Berthelot, Sir Michael Foster.

Six Resident Fellows have resigned; one has abandoned Fellowship.

New members have been elected as follows: Resident Fellows, three; Foreign Honorary Members, two.

The roll of the Academy now includes 189 Resident Fellows, 98 Associate Fellows, and 68 Foreign Honorary Members.

EDWARD ATKINSON

Edward Atkinson, a member of the American Academy of Arts and Sciences since March 12, 1879, was born in Brookline, Mass., on February 10, 1827, and died in Boston on December 11, 1905. He was descended on his father's side from the patriot minuteman, Lieutenant Amos Atkinson, and on the maternal side from Stephen Greenleaf, a well known fighter of Indians in the colonial period; thus honestly inheriting on both sides that combative spirit which marked his life in good causes. Owing to the business reverses of his father he was prevented from receiving, as his elder brother William Parsons Atkinson had received, a Harvard College education, a training which was also extended to all of Edward Atkinson's sons at a later day. At fifteen he entered the employment of Read and Chadwick, Commission Merchants, Boston, in the capacity of office boy; but he rapidly rose to the position of bookkeeper, and subsequently became connected with several cotton manufacturing companies in Lewiston, Maine, and elsewhere. He was for many years the treasurer of a number of such corporations, and in 1878 became President of the Boston Manufacturers Mutual Insurance Company. This business was in a somewhat chaotic state when he took hold of it, but he remained in this position until his death, having dur-

ing this time organized, enlarged, and perfected the mutual insurance of industrial concerns. In 1855 he married Miss Mary Caroline Heath of Brookline, who survives him with seven children, — Mrs. Ernest Winsor, E. W. Atkinson, Charles H. Atkinson, Wm. Atkinson, Robert W. Atkinson, Miss C. P. Atkinson, and Mrs. R. G. Wadsworth.

This gives the mere outline of a life of extraordinary activity and usefulness which well merits a further delineation in detail. Mr. Atkinson's interest in public life began with a vote for Horace Mann in 1848. Twenty years after, speaking at Salem, he described himself as never having been anything else than a Republican; but he was one of those who supported Cleveland for President in 1884 and whose general affinities were with the Democratic party. He opposed with especial vigor what is often called "the imperial policy," which followed the Cuban war, and he conducted a periodical of his own from time to time, making the most elaborate single battery which the war-party had to encounter.

He was from an early period of life a profuse and vigorous pamphleteer, his first pamphlet being published during the Civil War and entitled "Cheap Cotton by Free Labor," this publication leading to his acquaintance with David R. Wells and Charles Nordhoff, thenceforth his life-long friends. His early pamphlets were on the cotton question in different forms (1863–76); he wrote on blockade running (1865); on the Pacific railway (1871); and on mutual fire insurance (1885), this last being based on personal experience as the head of a mutual company. He was also, during his whole life, in print and otherwise, a strong and effective fighter for sound currency.

A large part of his attention from 1889 onward was occupied by experiments in cooking and diet, culminating in an invention of his own called "The Aladdin Oven." This led him into investigations as to the cost of nutrition in different countries, on which subject he also wrote pamphlets. He soon was led on into experiments so daring that he claimed to have proved it possible to cook personally, in open air, a five-course dinner for ten persons, and gave illustrations of this at outdoor entertainments. He claimed that good nutrition could be had for $1 per week, and that a family of five, by moderate management, could be comfortably supported for $180 per year ("Boston Herald, Oct. 8, 1891). These surprising figures unfortunately created among the laboring class a good deal of sharp criticism, culminating in the mistaken inquiry, why he did not feed his own family at $180 a year, if it was so easy? I can only say for one, that if the meals at that price were like a dinner of which I partook at his own house with an invited party, and at which I went through the promised five courses after

seeing them all prepared in the garden, I think that his standard of poverty came very near to luxury.

Mingled with these things in later years was introduced another valuable department of instruction. He was more and more called upon to give addresses, especially on manufactures, before Southern audiences, and there was no disposition to criticize him for his anti-slavery record. There could hardly be found another man whose knowledge of manufacturing and of insurance combined made him so fit a man to give counsel in the new business impulse showing itself at the South. He wrote much (1877) on cotton goods, called for an international cotton expedition, giving an address at Atlanta, Ga., which was printed in Boston in 1881.

Looking now at Atkinson's career with the eyes of a literary man, it seems clear to me that no college training could possibly have added to his power of accumulating knowledge or his wealth in the expression of it. But the academic tradition might have added to these general statements in each case some simple address or essay which would bring out clearly to the minds of an untrained audience the essential points of each single theme. Almost everything he left is the talk of a specially trained man to a limited audience, also well trained, — at least in the particular department to which he addresses himself. The men to whom he talks may not know how to read or write, but they are all practically versed in the subjects of which he treats. He talks as a miner to miners, a farmer to farmers, a cook to cooks; but among all of his papers which I have examined that in which he appears to the greatest advantage to the general reader is his "Address before the Alumni of Andover Theological Seminary" on June 9, 1886. Here he speaks as one representing a wholly different pursuit from that of his auditors; a layman to clergymen, or those aiming to become so. He says to them frankly at the outset, "I have often thought [at church] that if a member of the congregation could sometimes occupy the pulpit while the minister took his place in the pew, it might be a benefit to both. The duty has been assigned to me to-day to trace out the connection between morality and a true system of political or industrial economy."

He goes on to remind them that the book which is said to rank next to the Bible toward the benefit of the human race is Adam Smith's "Wealth of Nations," and that the same Adam Smith wrote a book on moral philosophy which is now but little read. He therefore takes the former of Smith's books, not the latter, as his theme, and thus proceeds:

"I wonder how many among your number ever recall the fact that it has been the richest manufacturers who have clothed the naked at the least cost to them; that it is the great bonanza farmer who now feeds the

hungry at the lowest price ; that Vanderbilt achieved his great fortune by reducing the cost of moving a barrel of flour a thousand miles, — from three dollars and fifty cents to less than seventy cents. This was the great work assigned to him, whether he knew it or not. His fortune was but an incident, — the main object, doubtless, to himself, but a trifling incident compared to what he saved others." [1]

He then goes on to show that whatever may be the tricks or wrongs of commerce, they lie on the surface, and that every great success is based upon very simple facts. "The great manufacturer," he says, "who guides the operations of a factory of a hundred thousand spindles, in which fifteen hundred men, women, and children earn their daily bread, himself works on a narrow margin of one fourth of a cent on each yard of cloth. If he shall not have applied truth to every branch of construction and of the operation of that factory, it will fail and become worthless ; and then with toilsome labor a hundred and fifty thousand women might try to clothe themselves and you, who are now clothed by the service of fifteen hundred only.

"Such is the disparity in the use of time, brought into beneficent action by modern manufacturing processes.

"The banker who deals in credit by millions upon millions must possess truth of insight, truth of judgment, truth of character. Probity and integrity constitute his capital, for the very reason that the little margin which he seeks to gain for his own service is but the smallest fraction of a per cent upon each transaction. I supervise directly or indirectly the insurance upon four hundred million dollars' worth of factory property. The products of these factories, machine-shops, and other works must be worth six hundred million dollars a year. It is n't worth fifty cents on each hundred dollars to guarantee their notes or obligations, while ninety-nine and one half per cent of all the sales they make will be promptly paid when due." [2]

He elsewhere turns from viewing the factory system with business eyes alone to the consideration of it from the point of view of the laborer. There is no want of sympathy, we soon find, in this man of inventions and statistics. He thus goes on:

"The very manner in which this great seething, toiling, crowded mass of laboring men and women bear the hardships of life leads one to faith in humanity and itself gives confidence in the future. If it were not that there is a Divine order even in the hardships which seem so severe, and that even the least religious, in the technical sense,

[1] Address to Alumni of Andover, p. 1.
[2] Ibid., p. 10.

have faith in each other, the anarchist and nihilist might be a cause of dread.

"As I walk through the great factories which are insured in the company of which I am president, trying to find out what more can be done to save them from destruction by fire, I wonder if I myself should not strike, just for the sake of variety, if I were a mule-spinner, obliged to bend over the machine, mending the ends of the thread, while I walked ten or fifteen miles a day without raising my eyes to the great light above. I wonder how men and women bear the monotony of the workshop and of the factory, in which the division of labor is carried to its utmost, and in which they must work year in and year out, only on some small part of a fabric or an implement, never becoming capable of making the whole fabric or of constructing the whole machine." [3]

We thus find him quite ready to turn his varied knowledge and his executive power towards schemes for the relief of the operative, schemes of which he left many.

Mr. Atkinson, a year or two later (1890), wrote a similarly popularized statement of social science for an address on "Religion and Life" before the American Unitarian Association. In his usual matter-of-fact way he had prepared himself by inquiring at the headquarters of different religious denominations for a printed creed of each. He first bought an Episcopal creed at the Old Corner Bookstore for two cents, an Orthodox creed at the Congregational Building for the same amount, then a Methodist two-cent creed also, a Baptist creed for five cents, and a Presbyterian one for ten, Unitarian and Universalist creeds being furnished him for nothing; and then he proceeds to give some extracts whose bigotry makes one shudder, and not wonder much that he expressed sympathy mainly with the Catholics and the Jews, rather than with the severer schools among Protestants. And it is already to be noticed how much the tendency of liberal thought, during the last twenty years, has been in the direction whither his sympathies went.

As time went on he underwent the test which awaits all Northern public men visiting the Southern States, but not met by all in so simple and straightforward a way as he. Those who doubt the capacity of the mass of men in our former slave States to listen to plainness of speech should turn with interest to Atkinson's plain talk to the leading men of Atlanta, Ga., in October, 1880. He says, almost at the beginning: "Now, gentlemen of the South, I am going to use free

[3] Address to Workingmen in Providence, April 11, 1886, p. 19.

speech for a purpose and to speak some plain words of truth and soberness to you. . . . I speak then to you here and now as a Republican of Republicans, as an Abolitionist of early time, a Free Soiler of later date, and a Republican of to-day." And the record is that he was received with applause. He goes on to say as frankly: "When slavery ended, not only were blacks made free from the bondage imposed by others, but whites as well were redeemed by the bondage they had imposed upon themselves. . . . When you study the past system of slave labor with the present system of free labor, irrespective of all personal considerations, you will be mad down to the soles of your boots to think that you ever tolerated it; and when you have come to this wholesome condition of mind you will wonder how the devil you could have been so slow in seeing it." [Laughter.]

Then he suddenly drops down to the solid fact and says: "Are you not asking Northern men to come here, and do you not seek Northern capital? If you suppose either will come here unless every man can say what he pleases, as I do now, you are mistaken." Then he goes on with his speech, rather long as he was apt to make them, but addressing a community much more leisurely than that which he had left at home; filling their minds with statistics, directions, and methods, till at last recurring to the question of caste and color he closes fearlessly: "As you convert the darkness and oppression and slavery to liberty and justice, so shall you be judged by men, and by Him who created all the nations of the South."

After tracing the course and training of an eminent American at home, it is often interesting to follow him into the new experiences of the foreign traveller. In that very amusing book, "Notes from a Diary," by Grant Duff (now Sir Mountstuart Elphinstone Grant Duff), the author writes that he came unexpectedly upon a breakfast (June, 1887), the guests being "Atkinson, the New England Free Trader, Colonel Hay, and Frederic Harrison, all of whom were well brought out by our host and talked admirably." I quote some extracts from the talk:

"Mr. Atkinson said that quite the best after-dinner speech he had ever heard was from Mr. Samuel Longfellow, brother of the poet. An excellent speech had been made by Mr. Longworth, and the proceedings should have closed, when Mr. Longfellow was very tactlessly asked to address the meeting, which he did in the words: 'It is, I think, well known that worth makes the man, but want of it the fellow,' and sat down." After this mild beginning we have records of good talk.

"Other subjects," Grant Duff says, "were the hostility of the So-

cialists in London to the Positivists and to the Trades' Unions; the great American fortunes and their causes, the rapid melting away of some of them, the hindrance which they are to political success; and servants in the United States, of whom Atkinson spoke relatively, Colonel Hay absolutely, well, saying that he usually kept his from six to eight years. . . .

"Atkinson said that all the young thought and ability in America is in favor of free trade, but that free trade has not begun to make any way politically. Harrison remarked that he was unwillingly, but ever more and more, being driven to believe that the residuum was almost entirely composed of people who would not work. Atkinson took the same view, observing that during the war much was said about the misery of the working women of Boston. He offered admirable terms if they would only go a little way into the country to work in his factory. Forty were at last got together to have the conditions explained — ten agreed to go next morning, of whom one arrived at the station, and she would not go alone!"

On another occasion we read in the "Diary": —

"We talked of Father Taylor, and he [Atkinson] told us that the great orator once began a sermon by leaning over the pulpit, with his arms folded, and saying, 'You people ought to be very good, if you 're not, for you live in Paradise already.'

"The conversation, in which Sir Louis Mallet took part, turned to Mill's economical heresies, especially that which relates to the fostering of infant industries. Atkinson drew a striking picture of the highly primitive economic condition of the South before the war, and said that now factories of all kinds are springing up throughout the country in spite of the keen competition of the North. He cited a piece of advice given to his brother by Theodore Parker, 'Never try to lecture down to your audience.' This maxim is in strict accordance with an opinion expressed by Hugh Miller, whom, having to address on the other side of the Firth just the same sort of people as those amongst whom he lived at Cromarty, I took as my guide in this matter during the long period in which I was connected with the Elgin Burghs."

"Atkinson went on to relate that at the time of Mr. Hayes's election to the presidency there was great danger of an outbreak, and he sat in council with General Taylor and Abraham Hewitt, doing his best to prevent it. At length he exclaimed: 'Now I think we may fairly say that the war is over. Here are we three acting together for a common object, and who are we? You, Mr. Hewitt, are the leader of the Democratic party in New York; I am an old Abolitionist who subscribed to furnish John Brown and his companions with rifles; you,

General Taylor, are the last Confederate officer who surrendered an army, and you surrendered it not because you were willing to do so, but, as you yourself admit, because you could n't help it.'"

The publication which will perhaps be much consulted in coming years as the best periodical organ of that party in the nation which was most opposed to the Philippine war will doubtless be the work issued by Mr. Atkinson on his own responsibility and by his own editing, from June 3, 1899, to September, 1900, under the name of "The Anti-Imperialist." It makes a solid volume of about 400 octavo pages, and was conducted wholly on Atkinson's own responsibility, financially and otherwise, though a large part of the expense was paid him by volunteers to the extent of $5,657.87 or more, covering an outlay of $5,870.62, this amount being largely received in sums of one dollar, obtained under what is known as the chain method. For this amount were printed more than 100,000 copies of a series of pamphlets, of which the first two were withdrawn from the mail as seditious under President McKinley's administration. A more complete triumph of personal independence was perhaps never seen in our literature, and it is easy to recognize the triumph it achieved for a high-minded and courageous as well as constitutionally self-willed man. The periodical exerted an influence which lasts to this day, although the rapidity of political change has now thrown it into the background for all except the systematic student of history. It seemed to Mr. Atkinson, at any rate, his crowning work.

The books published by Edward Atkinson were the following: "The Distribution of Profits," 1885; "The Industrial Progress of the Nation," 1889; "The Margin of Profit," 1890; "Taxation and Work," 1892; "Facts and Figures the Basis of Economic Science," 1894. This last was printed at the Riverside Press, the others being issued by Putnam & Co., New York. He wrote also the following papers in leading periodicals: "Is Cotton our King?" (Continental Monthly, March, 1862); "Revenue Reform" (Atlantic, October, 1871); "An American View of American Competition" (Fortnightly, London, March, 1879); "The Unlearned Professions" (Atlantic, June, 1880); "What makes the Rate of Interest" (Forum, 1880); "Elementary Instruction in the Mechanics Arts" (Century, May, 1881); "Leguminous Plants suggested for Ensilage" (Agricultural, 1882); "Economy in Domestic Cookery" (American Architect, May, 1887); "Must Humanity Starve at Last?" "How can Wages be Increased?" "The Struggle for Subsistence," "The Price of Life" (all in Forum for 1888); "How Society Reforms Itself," and "The Problem of Poverty" (both in

Forum for 1889); "A Single Tax on Land" (Century, 1890); and many others. When the amount of useful labor performed by the men of this generation comes to be reviewed a century hence, it is doubtful whether a more substantial and varied list will be found credited to the memory of any one in America than that which attaches to the memory of Edward Atkinson.

THOMAS WENTWORTH HIGGINSON.

American Academy of Arts and Sciences

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WILLIAM W. GOODWIN.

VICE-PRESIDENT.

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IRA N. HOLLIS,	JAMES C. WHITE, *Terms expire* 1909.	WILLIAM R. WARE.
HENRY P. TALBOT,	JOHN E. WOLFF, *Terms expire* 1910.	GEORGE L. KITTREDGE.

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AUDITING COMMITTEE.

A. LAWRENCE LOWELL, FREDERICK J. STIMSON.

HOUSE COMMITTEE.

WILLIAM R. WARE, *Chairman*.

A. LAWRENCE ROTCH, MORRIS H. MORGAN.

LIST

OF THE

FELLOWS AND FOREIGN HONORARY MEMBERS.

(Corrected to June 1, 1907.)

RESIDENT FELLOWS. — 192.

(Number limited to two hundred.)

CLASS I. — *Mathematical and Physical Sciences.* — 78.

SECTION I. — 15.

Mathematics and Astronomy.

Solon I. Bailey,	Cambridge.
Maxime Bôcher,	Cambridge.
William E. Byerly,	Cambridge.
Seth C. Chandler,	Wellesley Hills.
Gustavus Hay,	Boston.
Percival Lowell,	Boston.
Edward C. Pickering,	Cambridge.
William H. Pickering,	Cambridge.
John Ritchie, Jr.,	Roxbury.
Arthur Searle,	Cambridge.
William E. Story,	Worcester.
Henry Taber,	Worcester.
Harry W. Tyler,	Boston.
O. C. Wendell,	Cambridge.
P. S. Yendell,	Dorchester.

SECTION II. — 26.

Physics.

A. Graham Bell,	Washington, D.C.
Louis Bell,	Boston.
Clarence J. Blake,	Boston.
Francis Blake,	Weston.
George A. Campbell,	Boston.
Harry E. Clifford,	Newton.
Charles R. Cross,	Brookline.
A. W. Duff,	Worcester.
H. M. Goodwin,	Roxbury.
Edwin H. Hall,	Cambridge.
Hammond V. Hayes,	Cambridge.
William L. Hooper,	Somerville.
William W. Jacques,	Newton.
Frank A. Laws,	Boston.
Henry Lefavour,	Boston.
Theodore Lyman,	Brookline.
Charles L. Norton,	Boston.
Benjamin O. Peirce,	Cambridge.
George W. Pierce,	Cambridge.
A. Lawrence Rotch,	Boston.
Wallace C. Sabine,	Boston.
John S. Stone,	Boston.
Elihu Thomson,	Swampscott.
John Trowbridge,	Cambridge.
A. G. Webster,	Worcester.
Robert W. Willson,	Cambridge.

SECTION III. — 19.

Chemistry.

Gregory Paul Baxter,	Cambridge.
Arthur M. Comey,	Cambridge.
James M. Crafts,	Boston.
Charles W. Eliot,	Cambridge.
Charles L. Jackson,	Cambridge.
Walter L. Jennings,	Worcester.

Leonard P. Kinnicutt,	Worcester.
Charles F. Mabery,	Cleveland, O.
Arthur Michael,	Boston.
George D. Moore,	Worcester.
John U. Nef,	Chicago, Ill.
Arthur A. Noyes,	Boston.
Robert H. Richards,	Jamaica Plain.
Theodore W. Richards,	Cambridge.
Charles R. Sanger,	Cambridge.
Stephen P. Sharples,	Cambridge.
Francis H. Storer,	Boston.
Henry P. Talbot,	Newton.
Charles H. Wing,	Ledger, N. C.

SECTION IV. — 18.

Technology and Engineering.

Comfort A. Adams,	Cambridge.
Alfred E. Burton,	Boston.
Eliot C. Clarke,	Boston.
Heinrich O. Hofman,	Jamaica Plain.
Ira N. Hollis,	Cambridge.
L. J. Johnson,	Cambridge.
Arthur E. Kennelly,	Cambridge.
Gaetano Lanza,	Boston.
E. D. Leavitt,	Cambridge.
William R. Livermore,	New York.
Hiram F. Mills,	Lowell.
Cecil H. Peabody,	Brookline.
Andrew H. Russell,	Manila.
Albert Sauveur,	Cambridge.
Peter Schwamb,	Arlington.
H. L. Smyth,	Cambridge.
George F. Swain,	Boston.
William Watson,	Boston.

CLASS II. — *Natural and Physiological Sciences.* — 62.

SECTION I. — 14.

Geology, Mineralogy, and Physics of the Globe.

H. H. Clayton,	Milton.
Algernon Coolidge,	Boston.
William O. Crosby,	Jamaica Plain.
William M. Davis,	Cambridge.
Benj. K. Emerson,	Amherst.
O. W. Huntington,	Newport, R. I.
Robert T. Jackson,	Cambridge.
T. A. Jaggar, Jr.,	Cambridge.
William H. Niles,	Cambridge.
Charles Palache,	Cambridge.
John E. Pillsbury,	Boston.
Robert DeC. Ward,	Cambridge.
John E. Wolff,	Cambridge.
J. B. Woodworth,	Cambridge.

SECTION II. — 12.

Botany.

F. S. Collins,	Malden.
Geo. E. Davenport,	Medford.
William G. Farlow,	Cambridge.
Charles E. Faxon,	Jamaica Plain.
Merritt L. Fernald,	Cambridge.
George L. Goodale,	Cambridge.
John G. Jack,	Jamaica Plain.
Edward C. Jeffrey,	Cambridge.
B. L. Robinson,	Cambridge.
Charles S. Sargent,	Brookline.
Arthur B. Seymour,	Cambridge.
Roland Thaxter,	Cambridge.

SECTION III. — 23.

Zoölogy and Physiology.

Alexander Agassiz,	Cambridge.
Robert Amory,	Boston.

Henry P. Bowditch,	Jamaica Plain.
William Brewster,	Cambridge.
Louis Cabot,	Brookline.
Walter B. Cannon,	Cambridge.
William E. Castle,	Cambridge.
Samuel F. Clarke,	Williamstown.
W. T. Councilman,	Boston.
Harold C. Ernst,	Jamaica Plain.
Edward G. Gardiner,	Boston.
Samuel Henshaw,	Cambridge.
Theodore Hough,	Boston.
Edward L. Mark,	Cambridge.
Charles S. Minot,	Milton.
Edward S. Morse,	Salem.
George H. Parker,	Cambridge.
William T. Porter,	Boston.
James J. Putnam,	Boston.
Samuel H. Scudder,	Cambridge.
William T. Sedgwick,	Boston.
James C. White,	Boston.
William M. Woodworth,	Cambridge.

SECTION IV. — 13.

Medicine and Surgery.

Edward H. Bradford,	Boston.
Arthur T. Cabot,	Boston.
Thomas Dwight,	Nahant.
Reginald H. Fitz,	Boston.
Charles F. Folsom,	Boston.
Frederick I. Knight,	Boston.
Samuel J. Mixter,	Boston.
W. L. Richardson,	Boston.
Theobald Smith,	Jamaica Plain.
O. F. Wadsworth,	Boston.
Henry P. Walcott,	Cambridge.
John C. Warren,	Boston.
Francis H. Williams,	Boston.

CLASS III. — *Moral and Political Sciences.* — 52.

SECTION I. — 9.

Philosophy and Jurisprudence.

James B. Ames,	Cambridge.
Joseph H. Beal, Jr.,	Cambridge.
John C. Gray,	Boston.
Francis C. Lowell,	Boston.
Hugo Münsterberg,	Cambridge.
Josiah Royce,	Cambridge.
Frederic J. Stimson,	Dedham.
Edward H. Strobel,	Cambridge.
Samuel Williston,	Belmont.

SECTION II. — 19.

Philology and Archæology.

Charles P. Bowditch,	Jamaica Plain.
Lucien Carr,	Cambridge.
Franklin Carter,	Williamstown.
J. W. Fewkes,	Washington.
William W. Goodwin,	Cambridge.
Henry W. Haynes,	Boston.
Albert A. Howard,	Cambridge.
Charles R. Lanman,	Cambridge.
David G. Lyon,	Cambridge.
George F. Moore,	Cambridge.
Morris H. Morgan,	Cambridge.
Frederick W. Putnam,	Cambridge.
Edward Robinson,	New York.
Edward S. Sheldon,	Cambridge.
Herbert Weir Smyth,	Cambridge.
F. B. Stephenson,	Boston.
Crawford H. Toy,	Cambridge.
John W. White,	Cambridge.
John H. Wright,	Cambridge.

SECTION III. — 12.

Political Economy and History.

Charles F. Adams,	Lincoln.
Thomas N. Carver,	Cambridge.
Andrew McF. Davis,	Cambridge.
Ephraim Emerton,	Cambridge.
A. C. Goodell,	Salem.
Charles Gross,	Cambridge.
Henry C. Lodge,	Nahant.
A. Lawrence Lowell,	Boston.
James F. Rhodes,	Boston.
William Z. Ripley,	Newton.
Charles C. Smith,	Boston.
F. W. Taussig,	Cambridge.

SECTION IV. — 12.

Literature and the Fine Arts.

Francis Bartlett,	Boston.
Arlo Bates,	Boston.
Kuno Francke,	Cambridge.
Edward H. Hall,	Cambridge.
T. W. Higginson,	Cambridge.
George L. Kittredge,	Cambridge.
William C. Lane,	Cambridge.
Charles Eliot Norton,	Cambridge.
Denman W. Ross,	Cambridge.
William R. Ware,	Milton.
Herbert L. Warren,	Cambridge.
Barrett Wendell,	Boston.

ASSOCIATE FELLOWS. — 97.

(Number limited to one hundred. Elected as vacancies occur.)

CLASS I. — *Mathematical and Physical Sciences.* — 37.

SECTION I. — 14.

Mathematics and Astronomy.

Edward E. Barnard,	Williams Bay, Wis.
S. W. Burnham,	Williams Bay, Wis.
George Davidson,	San Francisco.
Fabian Franklin,	Baltimore.
Asaph Hall,	S. Norfolk, Conn.
George W. Hill,	W. Nyack, N.Y.
E. S. Holden,	New York.
Emory McClintock,	Morristown, N.J.
E. H. Moore,	Chicago.
Simon Newcomb,	Washington.
Charles L. Poor,	New York.
George M. Searle,	Washington.
J. N. Stockwell,	Cleveland, O.
Chas. A. Young,	Hanover, N. H.

SECTION II. — 6.

Physics.

Carl Barus,	Providence, R.I.
G. E. Hale,	Williams Bay, Wis.
T. C. Mendenhall,	Worcester.
A. A. Michelson,	Chicago.
E. L. Nichols,	Ithaca, N. Y.
M. I. Pupin,	New York.

SECTION III. — 9.

Chemistry.

Wolcott Gibbs,	Newport, R.I.
Frank A. Gooch,	New Haven.
Eugene W. Hilgard,	Berkeley, Cal.
S. W. Johnson,	New Haven.
J. W. Mallet,	Charlottesville, Va.
E. W. Morley,	Cleveland, O.
Charles E. Munroe,	Washington.
J. M. Ordway,	New Orleans.
Ira Remsen,	Baltimore.

SECTION IV. — 8.

Technology and Engineering.

Henry L. Abbot,	Cambridge.
Cyrus B. Comstock,	New York. [Va.
W. P. Craighill,	Charlestown, W.
John Fritz,	Bethlehem, Pa.
James D. Hague,	New York.
F. R. Hutton,	New York.
William Sellers,	Edge Moor, Del.
Robt. S. Woodward,	Washington.

CLASS II. — *Natural and Physiological Sciences.* — 32.

SECTION I. — 10.

Geology, Mineralogy, and Physics of the Globe.

Cleveland Abbe,	Washington.
George J. Brush,	New Haven.
T. C. Chamberlin,	Chicago.
Edward S. Dana,	New Haven.
Walter G. Davis,	Cordova, Arg.
Samuel F. Emmons,	Washington.
G. K. Gilbert,	Washington.
R. Pumpelly,	Newport, R.I.
Israel C. Russell,	Ann Arbor.
Charles D. Walcott,	Washington.

SECTION II. — 6.

Botany.

L. H. Bailey,	Ithaca, N. Y.
D. H. Campbell,	Palo Alto, Cal.
J. M. Coulter,	Chicago.
C. G. Pringle,	Charlotte, Vt.
John D. Smith,	Baltimore.
W. Trelease,	St. Louis.

SECTION III. — 9.

Zoölogy and Physiology.

Joel A. Allen,	New York.
W. K. Brooks,	Lake Roland, Md.
C. B. Davenport,	Cold Spring Harbor, N. Y.
F. P. Mall,	Baltimore.
S. Weir Mitchell,	Philadelphia.
H. F. Osborn,	New York.
A. E. Verrill,	New Haven.
C. O. Whitman,	Chicago.
E. B. Wilson,	New York.

SECTION IV. — 8.

Medicine and Surgery.

John S. Billings,	New York.
W. S. Halsted,	Baltimore.
Abraham Jacobi,	New York.
W. W. Keen,	Philadelphia.
William Osler,	Baltimore.
T. Mitchell Prudden,	New York.
Wm. H. Welch,	Baltimore.
H. C. Wood,	Philadelphia.

CLASS III. — *Moral and Political Sciences.* — 27.

SECTION I. — 6.

Philosophy and Jurisprudence.

Joseph H. Choate,	New York.
Melville W. Fuller,	Washington.
William W. Howe,	New Orleans.
Charles S. Peirce,	Milford, Pa.
G. W. Pepper,	Philadelphia.
T. R. Pynchon,	Hartford, Conn.

SECTION II. — 7.

Philology and Archæology.

Timothy Dwight,	New Haven.
B. L. Gildersleeve,	Baltimore.
D. C. Gilman,	Baltimore.
T. R. Lounsbury,	New Haven.
Rufus B. Richardson,	New York.
Thomas D. Seymour,	New Haven.
A. D. White,	Ithaca, N.Y.

SECTION III. — 7.

Political Economy and History.

Henry Adams,	Washington.
G. P. Fisher,	New Haven.
Arthur T. Hadley,	New Haven.
Henry C. Lea,	Philadelphia.
Alfred T. Mahan,	New York.
H. Morse Stephens,	Ithaca.
W. G. Sumner,	New Haven.

SECTION IV. — 7.

Literature and the Fine Arts.

James B. Angell,	Ann Arbor, Mich.
H. H. Furness,	Wallingford, Pa.
R. S. Greenough,	Florence.
Herbert Putnam,	Washington.
Augustus St. Gaudens,	Windsor, Vt.
John S. Sargent,	London.
E. C. Stedman,	Bronxville, N. Y.

FOREIGN HONORARY MEMBERS. — 68.

(Number limited to seventy-five. Elected as vacancies occur.)

Class I. — *Mathematical and Physical Sciences.* — 22.

Section I. — 7.

Mathematics and Astronomy.

Arthur Auwers,	Berlin.
George H. Darwin,	Cambridge.
Sir William Huggins,	London.
Felix Klein,	Göttingen.
Émile Picard,	Paris.
H. Poincaré,	Paris.
H. C. Vogel,	Potsdam.

Section II. — 5.

Physics.

Oliver Heaviside,	Newton Abbot.
F. Kohlrausch,	Marburg.
Joseph Larmor,	Cambridge.
Lord Rayleigh,	Witham.
Joseph J. Thomson,	Cambridge.

Section III. — 5.

Chemistry.

Adolf Ritter von Baeyer,	Munich.
J. H. van't Hoff,	Berlin.
Wilhelm Ostwald,	Leipsic.
Sir H. E. Roscoe,	London.
Julius Thomsen,	Copenhagen.

Section IV. — 5.

Technology and Engineering.

Sir Benjamin Baker,	London.
Lord Kelvin,	Largs.
Maurice Lévy,	Paris.
H. Müller-Breslau,	Berlin.
W. Cawthorne Unwin,	London.

Class II. — *Natural and Physiological Sciences.* — 23.

Section I. — 5.

Geology, Mineralogy, and Physics of the Globe.

Sir Archibald Geikie,	London.
Julius Hann,	Vienna.
Albert Heim,	Zurich.
Sir John Murray,	Edinburgh.
Henry C. Sorby,	Sheffield.

Section II. — 6.

Botany.

E. Bornet,	Paris.
A. Engler,	Berlin.
Sir Joseph D. Hooker,	Sunningdale.
W. Pfeffer,	Leipsic.
H. Graf zu Solms-Laubach,	Strassburg.
Eduard Strasburger,	Bonn.

SECTION III. — 5.

Zoölogy and Physiology.

Ludimar Hermann,	Königsberg.
H. Kronecker,	Bern.
E. Ray Lankester,	London.
Elias Metschnikoff,	Paris.
M. Gustav Retzius,	Stockholm.

SECTION IV. — 7.

Medicine and Surgery.

Emil von Behring,	Marburg.
Sir T. L. Brunton,	London.
A. Celli,	Rome.
Sir V. A. H. Horsley,	London.
R. Koch,	Berlin.
Lord Lister,	London.
F. v. Recklinghausen,	Strassburg.

CLASS III. — *Moral and Political Sciences.* — 23.

SECTION I. — 5.

Philosophy and Jurisprudence.

A. J. Balfour,	Prestonkirk.
Heinrich Brunner,	Berlin.
A. V. Dicey,	Oxford.
F. W. Maitland,	Cambridge.
Sir Frederick Pollock, Bart.,	London.

SECTION II. — 7.

Philology and Archæology.

Ingram Bywater,	Oxford.
F. Delitzsch,	Berlin.
Hermann Diels,	Berlin.
W. Dörpfeld,	Athens.
Sir John Evans,	Berkhampsted.
H. Jackson,	Cambridge.
G. C. C. Maspero,	Paris.

SECTION III. — 5.

Political Economy and History.

James Bryce,	London.
Adolf Harnack,	Berlin.
Sir G. O. Trevelyan, Bart.,	London.
John Morley,	London.
Pasquale Villari,	Florence.

SECTION IV. — 6.

Literature and the Fine Arts.

E. de Amicis,	Florence.
Gaston Boissier,	Paris.
Georg Brandes,	Copenhagen.
S. H. Butcher,	London.
Jean Léon Gérôme,	Paris.
Rudyard Kipling,	Burwash.

STATUTES AND STANDING VOTES.

STATUTES.

Adopted May 30, 1854: *amended September* 8, 1857, *November* 12, 1862, *May* 24, 1864, *November* 9, 1870, *May* 27, 1873, *January* 26, 1876, *June* 16, 1886, *October* 8, 1890, *January* 11, *and May* 10, 1893, *May* 9, *and October* 10, 1894, *March* 13, *April* 10, *and May* 8, 1895, *May* 8, 1901, *January* 8, 1902, *May* 10, 1905, *February* 14 *and March* 14, 1906.

CHAPTER I.

Of Fellows and Foreign Honorary Members.

1. The Academy consists of Resident Fellows, Associate Fellows, and Foreign Honorary Members. They are arranged in three Classes, according to the Arts and Sciences in which they are severally proficient, viz.: Class I. The Mathematical and Physical Sciences; — Class II. The Natural and Physiological Sciences; — Class III. The Moral and Political Sciences. Each Class is divided into four Sections, viz.: Class I., Section 1. Mathematics and Astronomy; — Section 2. Physics; — Section 3. Chemistry; — Section 4. Technology and Engineering. Class II., Section 1. Geology, Mineralogy, and Physics of the Globe; — Section 2. Botany; Section 3. Zoölogy and Physiology; — Section 4. Medicine and Surgery. Class III., Section 1. Theology, Philosophy, and Jurisprudence; — Section 2. Philology and Archæology; — Section 3. Political Economy and History; — Section 4. Literature and the Fine Arts.

2. The number of Resident Fellows residing in the Commonwealth of Massachusetts shall not exceed two hundred, of whom there shall not be more than eighty in any one of the three classes. Only residents in the Commonwealth of Massachusetts shall be eligible to election as Resident Fellows, but resident fellowship may be retained after removal from

the Commonwealth. Each Resident Fellow shall pay an admission fee of ten dollars and such annual assessment, not exceeding ten dollars, as shall be voted by the Academy at each annual meeting. Resident Fellows only may vote at the meetings of the Academy.

3. The number of Associate Fellows shall not exceed one hundred, of whom there shall not be more than forty in either of the three classes of the Academy. Associate Fellows shall be chosen from persons residing outside of the Commonwealth of Massachusetts. They shall not be liable to the payment of any fees or annual dues, but on removing within the Commonwealth they may be transferred by the Council to resident fellowship as vacancies there occur.

4. The number of Foreign Honorary Members shall not exceed seventy-five; and they shall be chosen from among persons most eminent in foreign countries for their discoveries and attainments in either of the three departments of knowledge above enumerated. There shall not be more than thirty Foreign Members in either of these departments.

CHAPTER II.

Of Officers.

1. There shall be a President, three Vice-Presidents, one for each Class, a Corresponding Secretary, a Recording Secretary, a Treasurer, and a Librarian, which officers shall be annually elected, by ballot, at the annual meeting, on the second Wednesday in May.

2. There shall be nine Councillors, chosen from the Resident Fellows. At each annual meeting, three Councillors shall be chosen, by ballot, one from each Class, to serve for three years; but the same Fellow shall not be eligible for two successive terms. The nine Councillors, with the President, the three Vice-Presidents, the two Secretaries, the Treasurer, and the Librarian, shall constitute the Council. Five members shall constitute a quorum. It shall be the duty of this Council to exercise a discreet supervision over all nominations and elections. With the consent of the Fellow interested, they shall have power to make transfers between the several sections of the same Class, reporting their action to the Academy.

3. The Council shall at its March Meeting receive reports from the Rumford Committee, the C. M. Warren Committee, the Committee on Publication, the Committee on the Library, the President and Record-

ing Secretary, and the Treasurer, proposing the appropriations for their work during the year beginning the following May. The Treasurer at the same meeting shall report on the income which will probably be received on account of the various Funds during the same year.

At the Annual Meeting, the Council shall submit to the Academy, for its action, a report recommending the appropriations which in the opinion of the Council should be made for the various purposes of the Academy.

4. If any office shall become vacant during the year, the vacancy shall be filled by a new election, at the next stated meeting, or at a meeting called for this purpose.

CHAPTER III.

Of Nominations of Officers.

1. At the stated meeting in March, the President shall appoint a Nominating Committee of three Resident Fellows, one for each Class.

2. It shall be the duty of this Nominating Committee to prepare a list of candidates for the offices of President, Vice-Presidents, Corresponding Secretary, Recording Secretary, Treasurer, Librarian, Councillors, and the Standing Committees which are chosen by ballot; and to cause this list to be sent by mail to all the Resident Fellows of the Academy not later than four weeks before the Annual Meeting.

3. Independent nominations for any office, signed by at least five Resident Fellows, and received by the Recording Secretary not less than ten days before the Annual Meeting, shall be inserted in the call for the Annual Meeting, which shall then be issued not later than one week before that meeting.

4. The Recording Secretary shall prepare for use, in voting at the Annual Meeting, a ballot containing the names of all persons nominated for office under the conditions given above.

5. When an office is to be filled at any other time than at the Annual Meeting, the President shall appoint a Nominating Committee in accordance with the provisions of Section 1, which shall announce its nomination in the manner prescribed in Section 2 at least two weeks before the time of election. Independent nominations, signed by at least five Resident Fellows and received by the Recording Secretary not later than one week before the meeting for election, shall be inserted in the call for that meeting.

CHAPTER IV.

Of the President.

1. It shall be the duty of the President, and, in his absence, of the senior Vice-President present, or next officer in order as above enumerated, to preside at the meetings of the Academy; to direct the Recording Secretary to call special meetings; and to execute or to see to the execution of the Statutes of the Academy. Length of continuous membership in the Academy shall determine the seniority of the Vice-Presidents.

2. The President, or, in his absence, the next officer as above enumerated, shall nominate members to serve on the different committees of the Academy which are not chosen by ballot.

3. Any deed or writing to which the common seal is to be affixed shall be signed and sealed by the President, when thereto authorized by the Academy.

CHAPTER V.

Of Standing Committees.

1. At the Annual Meeting there shall be chosen the following Standing Committees, to serve for the year ensuing, viz.: —

2. The Committee on Finance to consist of three Fellows to be chosen by ballot, who shall have, through the Treasurer, full control and management of the funds and trusts of the Academy, with the power of investing and of changing the investment of the same at their discretion.

3. The Rumford Committee, to consist of seven Fellows to be chosen by ballot, who shall consider and report to the Academy on all applications and claims for the Rumford premium. They shall also report to the Council in March of each year on all appropriations of the income of the Rumford Fund needed for the coming year, and shall generally see to the due and proper execution of the trust. All bills incurred on account of the Rumford Fund, within the limits of the appropriation made by the Academy, shall be approved by the Chairman of the Rumford Committee.

4. The C. M. Warren Committee, to consist of seven Fellows to be chosen by ballot, who shall consider and report to the Council in March of each year on all applications for appropriations from the income of the C. M. Warren Fund for the coming year, and shall generally see to the due

and proper execution of the trust. All bills incurred on account of the C. M. Warren Fund, within the limits of the appropriations made by the Academy, shall be approved by the Chairman of the C. M. Warren Committee.

5. The Committee on Publication, to consist of three Fellows, one from each class, to whom all communications submitted to the Academy for publication shall be referred, and to whom the printing of the Proceedings and Memoirs shall be entrusted. This Committee shall report to the Council in March of each year on the appropriations needed for the coming year. All bills incurred on account of publications, within the limits of the appropriations made by the Academy, shall be approved by the Chairman of the Committee on Publication.

6. The Committee on the Library, to consist of the Librarian *ex officio*, and three other Fellows, one from each class, who shall examine the Library and make an annual report on its condition and management. This Committee, through the Librarian, shall report to the Council in March of each year, on the appropriations needed for the Library for the coming year. All bills incurred on account of the Library, within the limits of the appropriations made by the Academy, shall be approved by the Librarian.

7. The President and Recording Secretary shall be a Committee on the general expenditures of the Academy. This Committee shall report to the Council in March of each year on the appropriations needed for the general expenditures for the coming year, and either member of the Committee may approve bills incurred on this account within the limits of the appropriations made by the Academy.

8. An auditing Committee, to consist of two Fellows, for auditing the accounts of the Treasurer, with power to employ an expert and to approve his bill.

9. In the absence of the Chairman of any Committee, bills may be approved by a member of the Committee designated by the Chairman for the purpose.

CHAPTER VI.

Of the Secretaries.

1. The Corresponding Secretary shall conduct the correspondence of the Academy, recording or making an entry of all letters written in its name, and preserving on file all letters which are received; and at each

meeting he shall present the letters which have been addressed to the Academy since the last meeting. Under the direction of the Council, he shall keep a list of the Resident Fellows, Associate Fellows, and Foreign Honorary Members, arranged in their Classes and in Sections in respect to the special sciences in which they are severally proficient; and he shall act as secretary to the Council.

2. The Recording Secretary shall have charge of the Charter and Statute-book, journals, and all literary papers belonging to the Academy. He shall record the proceedings of the Academy at its meetings; and after each meeting is duly opened, he shall read the record of the preceding meeting. He shall notify the meetings of the Academy, apprise officers and committees of their election or appointment, and inform the Treasurer of appropriations of money voted by the Academy. He shall post up in the Hall a list of the persons nominated for election into the Academy; and when any individual is chosen, he shall insert in the record the names of the Fellows by whom he was nominated.

3. The two Secretaries, with the Chairman of the Committee of Publication, shall have authority to publish such of the records of the meetings of the Academy as may seem to them calculated to promote its interests.

4. Every person taking any books, papers, or documents belonging to the Academy and in the custody of the Recording Secretary, shall give a receipt for the same to the Recording Secretary.

CHAPTER VII.

Of the Treasurer.

1. The Treasurer shall give such security for the trust reposed in him as the Academy shall require.

2. He shall receive all moneys due or payable to the Academy and all bequests and donations made to the Academy. He shall pay all bills due by the Academy, when approved by the proper officers (except those of the Treasurer's office, which may be paid without such approval). He shall sign all leases of real estate in the name of the Academy. All transfers of stocks, bonds, and other securities belonging to the Academy shall be made by the Treasurer with the written consent of one member of the Committee of Finance. He shall keep an account of all receipts and expenditures, shall submit his accounts annually to the Auditing

Committee, and shall report the same at the expiration of his term of office or whenever called on so to do by the Academy or Council.

3. The Treasurer shall keep separate accounts of the income and appropriation of the Rumford Fund and of other special funds, and report the same annually.

4. The Treasurer may appoint an Assistant Treasurer to perform his duties, for whose acts, as such assistant, the Treasurer shall be responsible; or the Treasurer may employ any Trust Company, doing business in Boston, as agent to perform his duties, the compensation of such Assistant Treasurer or agent to be paid from the funds of the Academy.

CHAPTER VIII.

Of the Librarian and Library.

1. It shall be the duty of the Librarian to take charge of the books, to keep a correct catalogue of them, to provide for the delivery of books from the Library, and to appoint such agents for these purposes as he may think necessary. He shall make an annual report on the condition of the Library.

2. The Librarian, in conjunction with the Committee on the Library, shall have authority to expend such sums as may be appropriated, either from the General, Rumford, or other special Funds of the Academy, for the purchase of books, periodicals, etc., and for defraying other necessary expenses connected with the Library.

3. To all books in the Library procured from the income of the Rumford Fund, or other special funds, the Librarian shall cause a stamp or label to be affixed, expressing the fact that they were so procured.

4. Every person who takes a book from the Library shall give a receipt for the same to the Librarian or his assistant.

5. Every book shall be returned in good order, regard being had to the necessary wear of the book with good usage. If any book shall be lost or injured, the person to whom it stands charged shall replace it by a new volume or set, if it belongs to a set, or pay the current price of the volume or set to the Librarian; and thereupon the remainder of the set, if the volume belonged to a set, shall be delivered to the person so paying for the same.

6. All books shall be returned to the Library for examination at least one week before the Annual Meeting.

7. The Librarian shall have custody of the Publications of the Academy. With the advice and consent of the President, he may effect exchanges with other associations.

CHAPTER IX.

Of Meetings.

1. There shall be annually four stated meetings of the Academy; namely, on the second Wednesday in May (the Annual Meeting), on the second Wednesday in October, on the second Wednesday in January, and on the second Wednesday in March. At these meetings, only, or at meetings adjourned from these and regularly notified, or at special meetings called for the purpose, shall appropriations of money be made, or alterations of the statutes or standing votes of the Academy be effected.

Special meetings shall be called by the Recording Secretary at the request of the President or of a Vice-President or of five Fellows. Notifications of the special meetings shall contain a statement of the purpose for which the meeting is called.

2. Fifteen Resident Fellows shall constitute a quorum for the transaction of business at a stated or special meeting. Seven Fellows shall be sufficient to constitute a meeting for scientific communications and discussions.

3. The Recording Secretary shall notify the meetings of the Academy to each Resident Fellow; and he may cause the meetings to be advertised, whenever he deems such further notice to be needful.

CHAPTER X.

Of the Election of Fellows and Honorary Members.

1. Elections shall be made by ballot, and only at stated meetings.

2. Candidates for election as Resident Fellows must be proposed by two Resident Fellows of the section to which the proposal is made, in a recommendation signed by them; and this recommendation shall be transmitted to the Corresponding Secretary, and by him referred to the Council. No person recommended shall be reported by the Council as a

candidate for election, unless he shall have received the approval of at least five members of the Council present at a meeting. All nominations thus approved shall be read to the Academy at any meeting, and shall then stand on the nomination list until the next stated meeting, and until the balloting. No person shall be elected a Resident Fellow, unless he shall have been resident in this Commonwealth one year next preceding his election. If any person elected a Resident Fellow shall neglect for one year to pay his admission fee, his election shall be void; and if any Resident Fellow shall neglect to pay his annual assessments for two years, provided that his attention shall have been called to this article, he shall be deemed to have abandoned his Fellowship; but it shall be in the power of the Treasurer, with the consent of the Council, to dispense (*sub silentio*) with the payment both of the admission fee and of the assessments, whenever in any special instance he shall think it advisable so to do.

3. The nomination and election of Associate Fellows shall take place in the manner prescribed in reference to Resident Fellows.

4. The nomination and election of Foreign Honorary Members shall take place in the manner prescribed for Resident Fellows, except that the nomination papers shall be signed by at least seven members of the Council before being presented to the Academy.

5. Three-fourths of the ballots cast must be affirmative, and the number of affirmative ballots must amount to eleven to effect an election of Fellows or Foreign Honorary Members.

6. If, in the opinion of a majority of the entire Council, any Fellow — Resident or Associate — shall have rendered himself unworthy of a place in the Academy, the Council shall recommend to the Academy the termination of his Fellowship; and provided that a majority of two-thirds of the Fellows at a stated meeting, consisting of not less than fifty Fellows, shall adopt this recommendation, his name shall be stricken off the roll of Fellows.

CHAPTER XI.

Of Amendments of the Statutes.

1. All proposed alterations of the Statutes, or additions to them, shall be referred to a committee, and, on their report at a subsequent stated meeting or a special meeting called for the purpose, shall require for

enactment a majority of two-thirds of the members present, and at least eighteen affirmative votes.

2. Standing votes may be passed, amended, or rescinded at a stated meeting, or a special meeting called for the purpose by a majority of two-thirds of the members present. They may be suspended by a unanimous vote.

CHAPTER XII.

Of Literary Performances.

1. The Academy will not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its publications.

STANDING VOTES.

1. Communications of which notice has been given to the Secretary shall take precedence of those not so notified.

2. Associate Fellows, Foreign Honorary Members, and Resident Fellows, who have paid all fees and dues chargeable to them, are entitled to receive one copy of each volume or article printed by the Academy on application to the Librarian personally or by written order within two years of the date of publication. Exceptions to this rule may be made in special cases by vote of the Academy.

3. The Committee of Publication shall fix from time to time the price at which the publications of the Academy may be sold. But members may be supplied at half this price with volumes which they are not entitled to receive free, and which are needed to complete their sets.

4. Two hundred extra copies of each paper accepted for publication in the Memoirs or Proceedings of the Academy shall be placed at the disposal of the author, free of charge.

5. Resident Fellows may borrow and have out from the Library six volumes at any one time, and may retain the same for three months, and no longer.

6. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library for a limited period.

7. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy, except by special leave of the Librarian.

8. Books, publications, or apparatus shall be procured from the income of the Rumford Fund only on the certificate of the Rumford Committee that they, in their opinion, will best facilitate and encourage the making of discoveries and improvements which may merit the Rumford Premium; and the approval of a bill incurred for such purposes by the Chairman shall be accepted by the Treasurer as proof that such certificate has been given.

9. A meeting for receiving and discussing scientific communications may be held on the second Wednesday of each month not appointed for stated meetings, excepting July, August, and September.

RUMFORD PREMIUM.

In conformity with the terms of the gift of Benjamin, Count Rumford, granting a certain fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his letter of gift, the Academy is empowered to make from the income of said fund, as it now exists, at any Annual Meeting, an award of a gold and a silver medal, being together of the intrinsic value of three hundred dollars, as a premium to the author of any important discovery or useful improvement in light or in heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American islands; preference being always given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind; and to add to such medals, as a further premium for such discovery and improvement, if the Academy see fit so to do, a sum of money not exceeding three hundred dollars.

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